ABSTRACT OF THE DISCLOSURE

Various components of the present invention are collectively designated as Analysis of Variables Through Analog Representation (AVATAR). It is a method, processes, and apparatus for measurement and analysis of variables of different type and origin. AVATAR offers an analog solution to those problems of the analysis of variables which are normally handled by digital means. The invention allows (a) the improved perception of the measurements through geometrical analogies, (b) effective solutions of the existing computational problems of the order statistic methods, and (c) extended applicability of these methods to analysis of variables.

The invention employs transformation of discrete or continuous variables into normalized continuous scalar fields, that is, into objects with mathematical properties of density and/or cumulative distribution functions. In addition to dependence on the displacement coordinates (thresholds), these objects can also depend on other parameters, including spatial coordinates (e.g., if the incoming variables are themselves scalar or vector fields), and/or time (if the variables depend on time). Moreover, this transformation of the measured variables may be implemented with respect to any reference variable. Thus, the values of the reference variable provide a common unit, or standard, for measuring and comparison of variables of different natures, for assessment of mutual dependence of these variables, and for evaluation of changes in the variables and their dependence with time.

The invention enables, on a consistent general basis, a variety of new techniques for analysis of variables, which can be implemented through various physical means in continuous action machines as well as through digital means or computer calculations. Several of the elements of these new techniques do have digital counterparts, such as some rank order techniques in digital signal and image processing. However, this invention significantly extends the scope and applicability of these techniques and enables their analog implementation. The invention also introduces a wide range of signal analysis tools which do not exist, and cannot be defined, in the digital domain. In addition, by the present invention, all existing techniques for statistical processing of data, and for studying probability fluxes, are made applicable to analysis of any variable.